

## ***Activity name: Romance and Russian Roulette***

This lab activity demonstrates 1) how epidemics are spread and 2) the importance of condoms for preventing the spread of AIDS and other sexually transmitted diseases.

This activity is meant to provide a real-world application of the ATEEC Recommended Core Curriculum's math, science, technical, communications, or critical thinking knowledge and skill concepts, which have been identified by the ATEEC Fellows as necessary preparation for environmental technology occupations.

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*Appropriate for which course(s)?* HS environmental biology, CC biology or Introduction to Environmental Technology

*Concept/skill learned (i.e. from [K/S Tables](#)):* Chemistry of acids and bases

*Approximate time to complete activity:* 30 - 50 minutes

*Source of idea or activity (for published source, please include author, title, publisher, date):* AIDS background reading from *Grolier Multimedia Encyclopedia*. The activity is a common one for developing AIDS awareness and is modified from "Transmission Tracker" in *The Science of HIV*, published by the National Science Teachers Association in 1997.

*Materials/resources needed (equipment, print media, electronic media, videos, supplies, etc.):*

For each person doing activity: one 20 ounce (563 ml) clear plastic glass (available in picnic supplies area of many stores).

For each person doing activity: 10 ounces (450 ml) of a mixture of 90% distilled water and 10% alcohol (ethanol).

Five ounces (280 ml) of phenolphthalein pH indicator (ordered from a science supply catalog).

One ounce (45 ml) of 0.2 N sodium hydroxide (in a dropper bottle - may be ordered from a science supply catalog) or 0.2 N sodium bicarbonate (baking soda)

**Notes to teacher only: Place a very small mark on the bottom of the cup of phenolphthalein, so only the teacher knows which cup it is.**

**Remind students of lab safety rules: Do not touch, smell, or taste chemicals.**

*Learning objectives - Students will be able to:*

1. State the importance of condoms in helping to prevent the spread of AIDS and other sexually transmitted diseases.
2. State the causes and prevention of AIDS.
3. Demonstrate how epidemics are spread.
4. Demonstrate the chemistry of acids and bases.
5. Demonstrate the exponential calculations of the rate that diseases are spread.

**SCANS** skills addressed: Reading, writing, math, listening, speaking, creative thinking, problem solving, responsibility, self-esteem, sociability, self-management, and integrity.

Primary instructional method: Reading, discussion, lab activity

*Description of Activity:*

1. Provide each student a 20-ounce clear glass containing 10 ounces (450 ml) of fluid that is 90% water and 10% alcohol. For one of the glasses, the teacher secretly substitutes a glass containing a fluid that is 5 ounces (280 ml) of a clear pH indicator (phenolphthalein) and 5 ounces (280 ml) of the water-alcohol mixture. That glass of fluid represents a person who unknowingly has the HIV virus.
2. Students are instructed to go around the class and mix the fluid in their glasses with the fluid of three other people (representing having sexual relations and mixing body fluids without protection by condoms).
3. Each person keeps a record of who they mix their glasses with.
4. Next, the Instructor puts four drops of a base (0.2 N Sodium hydroxide or 0.2 N sodium bicarbonate) into each glass. (This represents the clinical test for HIV antibodies.)
5. The glasses that have in them some of the clear pH indicator (phenolphthalein) should turn pink. This indicates that person is "infected." People whose glasses stay clear are "not infected."
6. The class determines the following:
  - o Who did each "infected" person get the virus from?
  - o Who is the original person to "have the HIV virus"?
  - o How many people would be "infected" if each class member mixed their glasses with only one person? with two people? with three people? with four people? or with five people?
7. The class discusses concepts and issues such as:
  - o The modes of transmitting HIV through body fluids.
  - o The importance of limiting the number of sexual partners (e.g., to 0 or 1).
  - o The role of condoms in limiting the spread of the HIV virus and other sexually transmitted diseases, and their limitations.

- How epidemics occur.
- Fallacies about HIV transmission.

*Students' Background reading:*

### **Background on AIDS**

Acquired immune deficiency syndrome (AIDS) is caused by infection with the human immunodeficiency virus (HIV), which attacks Helper T lymphocyte (T4 Cells) and Macrophage white blood cells in the immune system and produces defects in the immune system function. These defects may not be apparent for years. They lead, however, to a severe suppression of the immune system's ability to resist other harmful organisms. This leaves the body open to invasion by various infections, which are therefore called opportunistic diseases, and to the development of unusual cancers. Following infection with HIV, an individual may show no symptoms at all or may develop an acute but brief mononucleosis-like illness. The period between initial infection and the development of AIDS is currently observed to vary from about 6 months to 10 years. Various estimates indicate that somewhere between 26 and 46 percent of the infected individuals will go on to develop full-blown AIDS within a little more than seven years following infection. Once AIDS sets in, the clinical course generally follows a rapid decline; most people with AIDS die within three years.

Because the T4 cell is involved in almost all immune responses, its depletion renders the body highly susceptible to opportunistic infections and tumorous growths. The most predominant and threatening complication is *Pneumocystis carinii* pneumonia, which is frequently the first infection to occur and is the most common cause of death. Other infections include the parasites *Toxoplasma gondii* and *Cryptosporidiosis*; fungi such as *Candida* and *Cryptococcia*; mycobacteria such as *Mycobacterium avium*, *intracellulare*, and *tuberculosis*; and viruses such as *cytomegalovirus* and *herpes simplex*. Increased susceptibility to bacterial infection is noted particularly among children with AIDS. Many AIDS patients develop cancers, including Kaposi's sarcoma, non-Hodgkin's lymphoma, and Hodgkin's disease. Other HIV-related syndromes include nephritis (kidney disease), arthritis, and lung inflammation (pneumonitis). HIV also tends to reach certain brain cells. This leads to so-called neuropsychiatric abnormalities, or psychological disturbances caused by physical damage to the brain's nerve cells.

Since the first AIDS cases were reported in 1981, through mid-1995 more than 476,000 AIDS cases and more than 295,000 deaths have been reported in the United States alone. This is only the tip of the iceberg of HIV infection, however. It is estimated that nearly 1 million Americans had been infected with the virus through the mid-1990s but had not yet developed clinical symptoms. In addition, AIDS cases have also been reported in almost every country in the world, with an estimated cumulative 19 million adults and children infected worldwide since the late 1970s. Sub-Saharan Africa has been hit hardest, with over 11 million adults infected, followed by Southeast Asia, with over 3.5 million adults infected.

No cure or vaccine now exists for AIDS. Many of those infected with HIV may not even be aware that they carry and can spread the virus. Combating it is a major challenge to biomedical scientists and health-care providers. HIV infection and AIDS represent among the most pressing public-policy and public-health problems worldwide.

### **Modes of Transmission**

Researchers have isolated HIV from a number of body fluids, including blood, semen, saliva, tears, urine, cerebrospinal fluid, breast milk, and cervical and vaginal secretions. Strong evidence indicates, however, that HIV is transmitted only through four primary routes: sexual intercourse, whether vaginal or anal, with an infected individual; exposure to infected blood or blood products; intravenous drug users exposed to HIV-infected blood through shared needles; and from an infected mother to her child before or during birth.

No scientific evidence supports transmission of HIV through ordinary contact. Health-care workers have been infected with HIV from exposure to contaminated blood or by accidentally sticking themselves with contaminated needles.

### **Efforts at Prevention**

In the absence of an effective vaccine or therapy, education and risk reduction remain the most powerful tools in the fight against AIDS. Because of the limited number of transmission routes, the further spread of AIDS could virtually be stopped by avoiding behaviors that place persons at risk. Education can help to achieve this, through development and dissemination of materials by local community groups, statewide organizations, and national governments. It is important to understand the role of condoms in limiting the spread of AIDS and other sexually transmitted diseases. This is especially important for teenagers and young adults, because these are the groups having the fastest rate of increased cases of AIDS and other sexually transmitted diseases.

*Activity submitted by* **Bob Hubert**

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